MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

PMT0201 – MATHEMATICS II

(TC1L)

13 FEBRUARY 2023
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **2** pages (excluding the cover page) with **5** questions only.

2. Answer **ALL** questions.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps must be shown.

QUESTION 1 [13 Marks]

a) Find the ***exact value*** of $5\cot^2\left(\cos^{-1}\left(-\frac{3}{8}\right)\right)$. (2 marks)

b) It is known that $\sin\theta = -\frac{5}{13}$ and that θ is an angle in Quadrant III. Find the ***exact value*** of $\cot\theta\csc\theta$. (2 marks)

c) Let $f(x) = 3\sin\left(\frac{\theta}{2} - \frac{\pi}{4}\right)$.

i. Find the amplitude, period and phase shift of the given function above. (2 marks)

ii. Sketch one complete period of $y = 3\sin\left(\frac{\theta}{2}\right)$. (2 marks)

iii. In the same graph, sketch one complete period of $f(x) = 3\sin\left(\frac{\theta}{2} - \frac{\pi}{4}\right)$, showing clearly the x and y intercepts (if any). (2 marks)

d) A triangle ABC is such that $AB = 16$ cm, $BC = 12$ cm and $\angle ABC = 70°$. Find the length of AC. Then, find the area of the triangle ABC. (3 marks)

QUESTION 2 [10 Marks]

a) Solve the equation $2\sin^2\theta + \csc^2\theta = 3$ for $0° \le \theta \le 360°$. (3 marks)

b) Show that $\frac{1+\cos 2x}{\sin 2x} = \cot x$. Then, without a calculator, find $\cot(67.5°)$. (3 marks)

c) Given the complex number $z = -2\sqrt{3} + 2i$. Write z in polar form. Then, use De Moivre's Theorem to find z^4. Write your final answer in the form $a + bi$. (4 marks)

QUESTION 3 [8 Marks]

a) Find $\lim_{x\to 0} \frac{x}{(x-1)^2-1}$. (3 marks)

b) Given $f(x) = \begin{cases} 3x + 4k & x \ge 0 \\ \sqrt{x+16} + 4 & x < 0 \end{cases}$. Find the value of k if the function f is continuous at $x = 0$. (2 marks)

c) Find $\lim_{x\to\infty} \sqrt{\frac{2x^4-7x^2-6x}{8x^4+3x}}$. (3 marks)

Continued...

QUESTION 4 [9 Marks]

a) Find the derivative of $f(x) = x^3 \ln x$. (2 marks)

b) Find $\frac{dy}{dx}$ for $y = \frac{5+\cos x}{\sin x}$. (2 marks)

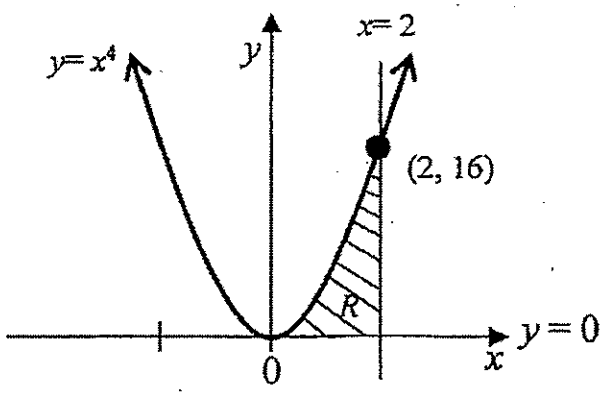
c) The displacement of particle relative to a point O is given by $s(t) = \frac{1}{3}t^3 - 2t^2 + 3t$, where s is in metres and t is in seconds. Find the displacement of the particle when its acceleration is equal to 0 ms^{-2}. (2 marks)

d) Find the absolute maximum and absolute minimum values of $f(x) = 2x^4 + 8x^3 - 7$ on the closed interval [–5, 5]. (3 marks)

QUESTION 5 [10 Marks]

a) Find the indefinite integral $\int \frac{3x+1}{x^2-1}\,dx$ using partial fractions. (4 marks)

b) Find the area of the region R in the diagram below. (2 marks)



c) Use integration by parts to find $\int 3x \sin 2x\,dx$. (4 marks)

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